



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

NGUYEN ET AL.

CASE NO: FA1216 US NA

SERIAL NO: 10/722,796

GROUP ART UNIT: 1762

FILED: NOVEMBER 25, 2003

EXAMINER: E. TSOY

FOR: PROCESS FOR MULTI-LAYER  
COATING OF SUBSTRATES

**SUPPLEMENTAL APPEAL BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
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Sir:

The following is a Supplemental Appeal Brief furnished in response to the Board of Patent Appeals and Interferences' Remand to the Examiner dated July 12, 2007.

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#### **I. REAL PARTY IN INTEREST**

The real party in interest is E.I. du Pont de Nemours and Company, owner of the Application.

#### **II. RELATED APPEALS AND INTERFERENCES**

Appeal of U.S. Patent Application Serial No. 10/171,206 may directly affect or be directly affected by or have a bearing on the Board of Patent Appeals and Interferences' (*hereinafter* the "Board") decision in the present Appeal.

#### **III. STATUS OF THE CLAIMS**

Claims 1-6 and 8-9 stand rejected and are the subject of this Appeal. Originally-filed Claims 7 and 10 have been canceled.

#### **IV. STATUS OF AMENDMENTS**

No amendments were made to the claims in response to the Final Office Action.

#### **V. SUMMARY OF CLAIMED SUBJECT MATTER**

Claim 1, the only independent claim at issue, relates to a process for multi-layer coating of vehicles and vehicle parts (see page 1, lines 5-8) which comprises the steps of applying at least two coating layers and curing of the applied coatings (see page 2, lines 6-8); wherein at least one of the coating layers is formed from a coating composition comprising a binder system of resin solids wherein the resin has free-radically polymerizable olefinic double bonds (see page 3, lines 5-9; page 3, lines 23-26), hydrolyzable alkoxysilane groups (see page 5, lines 22-28), and hydroxyl groups (see page 8, lines 10-17), wherein the resin solids content of the coating composition has an equivalent weight of C=C double bonds of 200 – 2000 (see page 2, lines 11-13) and has a silicon content of 1 – 10 wt-% (see page 2, lines 13-15), wherein the silicon is bound in alkoxysilane groups (see page 2, lines 13-15) and wherein the step of curing of the at least one coating layer comprises exposure to thermal energy (see page 3, line 29 – page 4, line 5) thereby polymerizing the C=C double bonds via free radical polymerization and exposure to moisture (see

page 14, lines 8-20) thereby forming siloxane bridges from the alkoxysilane groups (see page 3, line 29 – page 4, line 2).

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Whether Claims 1, 3, and 5-6 are anticipated by Mizutani *et al.* (U.S. Patent No. 5,780,530) as evidenced by Wu *et al.* (U.S. Patent No. 6,039,872).

Whether Claims 1-6 and 9 are obvious under 35 U.S.C. § 103(a) in view of Mizutani *et al.* in further view of Wu *et al.*

Whether Claims 1-6 and 8-9 are obvious under 35 U.S.C. § 103(a) in view of Gaglani (U.S. Patent No. 5,312,943) in further view of Murase (U.S. Patent No. 4,246,368) in further view of Wu *et al.* in further view of Bergstrom *et al.* (U.S. Patent No. 6,384,125).

Whether Claims 1-6 and 8-9 are obvious under 35 U.S.C. § 103(a) in view of Maag *et al.* (U.S. Patent No. 6,333,077) in view of Gaglani in further view of Wu *et al.* in further view of Bergstrom *et al.*

## **VII. ARGUMENT**

### **A. The Final Office Action**

Claims 1, 3, and 5-6 were rejected as anticipated by Mizutani *et al.* as evidenced by Wu *et al.* The Examiner asserted that Claims 1, 3, and 5-6 remained rejected as stated in the June 20, 2005, Non-Final Office Action (*hereinafter* “NF Office Action”). In the NF Office Action, the Examiner argued that Mizutani *et al.* expressly disclosed all elements of Applicants claim 1, 3, and 5-6 inventions except for two points where the Examiner either used personal knowledge or proof of inherency to supplement the Mizutani *et al.* disclosure. NF Office Action at page 4, 3<sup>rd</sup> paragraph. In relation to the first point, the Examiner’s position was that “the coating comprising alkoxysilyl groups cures upon exposure to air humidity by forming siloxane bridges under the action of moisture.” *Id.* at page 5, 1<sup>st</sup> paragraph. In relation to the second point, the Examiner’s position was that “baking promotes free-radical polymerization of C=C double bonds since it is well known that the application of *any* conventional energy source such as heat, ultraviolet light, gamma radiation,

electron beam radiation initiates free radical polymerization of C=C double bonds, as evidenced by Wu et al (See column 12, lines 24-28).” *Id.* at page 5, 2<sup>nd</sup> paragraph.

In the Final Office Action, in response to the Applicants’ arguments to the contrary, the Examiner maintained the arguments set forth in the NF Final Office Action. Final Office Action at page 3, 3<sup>rd</sup> paragraph. The Examiner further argued that

[i]t is well known in the art that thermal initiators may be optionally combined with unsaturated compounds to initiate free-radical polymerization of the unsaturated compounds in thermal curing, as evidenced by US 20040110856 to Young et al (See P45). Therefore heating of unsaturated compounds in Mizutani et al [sic] up to 240°C would certainly trigger radical polymerization of the unsaturated compounds even in the absence of thermal initiators.

*Id.* at page 5, 1<sup>st</sup> paragraph (internal markings omitted).

Claims 1-6 and 9 were rejected as being obvious over Mizutani *et al.* in view of Wu *et al.* The Examiner asserted that Claims 1-6 and 9 remained rejected as stated in the NF Office Action. In the NF Office Action, the Examiner asserted that Mizutani *et al.* was applied to the obviousness rejection for the same reasons as set forth in the anticipation rejection, NF Office Action at page 6, 1<sup>st</sup> paragraph, except that Mizutani *et al.* “fail to teach: (i) that thermal energy is used instead of UV radiation (Claim 1); (ii) the pigmented coating is applied repeatedly so that the pigmented coating is applied over the applied pigmented coatings (Claims 2, 4).” *Id.* In relation to (i), the Examiner stated that it would have been obvious to use conventional heating instead of UV radiation because “Wu et al teach that heat is functionally equivalent to ultraviolet light or gamma radiation (high energy radiation) for crosslinking acrylate group containing compounds by initiating free radical polymerization of acrylate groups.” *Id.* at page 6, 3<sup>rd</sup> paragraph. In regards to (ii), the Examiner asserted that “[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied a pigmented coating composition in Mizutani et al repeatedly with the expectation of providing the desired thickness of the coating film according to well known technique [sic].” *Id.* at page 6, 5<sup>th</sup> paragraph. Mizutani *et al.* was also asserted to disclose that the process therein can be used for coating automotive bodies. *Id.* at page 6, 6<sup>th</sup> paragraph.

Claims 1-6 and 8-9 were rejected as being obvious over either Gaglani in view of Murase in further view of Wu *et al.* in further view of Bergstrom *et al.* (U.S. Patent No. 6,384,125) or Maag *et al.* (U.S. Patent No. 6,333,077) in view of Gaglani in further view of Wu *et al.* in further view of Bergstrom *et al.* The Examiner asserted that Claims 1-6 and 8-9 remained rejected as stated in the NF Office Action. In the NF Office Action, the Examiner asserted that Gaglani disclosed all of the limitations of Applicants' claim 1-6 and 8-9 inventions, NF Office Action at page 7, 1<sup>st</sup> paragraph, except where the Examiner admitted that "Gaglani fails to teach that: (i) thermal energy is used instead of UV radiation (Claim 1); (ii) the protective covering is formed by at least two coating layers (Claims 1, 2); the protective covering is pigmented and applied over a primer layer (Claim 3)." *Id.* at page 7, 2<sup>nd</sup> paragraph. In relation to (i), the Examiner again asserted that Wu *et al.* make it obvious to use conventional heating instead of UV radiation. *Id.* at page 8, 1<sup>st</sup> paragraph. In relation to (ii) the Examiner asserted that Murase teaches repeated application of coatings to reach a desired thickness. *Id.* at page 8, 2<sup>nd</sup> paragraph. The Examiner concluded that it would have been obvious to "have applied clear or pigmented coating composition [sic] of Gaglani repeatedly over substrates since Murase teaches that a single composition can be applied repeatedly to substrates to provide the desired thickness of protective coating." *Id.* at page 8, 3<sup>rd</sup> paragraph (internal markings omitted). The Examiner further concluded that it would have been obvious to "have applied clear or pigmented coating composition [sic] of Gaglani over primed substrates with the expectation of providing the desired high adhesion to the particular substrate and other desirable properties, as taught by Murase." *Id.* at page 8, 4<sup>th</sup> paragraph.

In relation to Maag *et al.*, the Examiner asserted that Maag *et al.* disclosed all of the elements of Applicants' claim 1-6 and 8-9 inventions, NF Office Action at page 9, 2<sup>nd</sup> paragraph, except where the Examiner admitted that "Maag *et al.* fail to teach that the UV-curable polymerizable binder system having a built-in secondary thermally curing mechanism contains a silicone (meth)acrylate component which has urethane linkages and both radiation curable olefinic double bonds and thermally curable condensation groups." *Id.* at page 10, 1<sup>st</sup> paragraph (internal markings omitted). The Examiner assert that Gaglani filled-in the disclosure missing from

Maag *et al.* NF Office Action at page 10, 2<sup>nd</sup> paragraph. The Examiner thus concluded that it would have been obvious to use “a coating composition of Gaglani as a clear lacquer coating composition in Maag *et al* with the expectation of providing the desired cure of exposed areas under UV radiation and complete cure of shadow areas under conditions of ambient temperature and humidity, as taught by Gaglani.” *Id.* at page 10, 3<sup>rd</sup> paragraph. Wu *et al.* was again applied as discussed above. *Id.* at page 11, 2<sup>nd</sup> paragraph.

In the NF Office Action, the Examiner admitted that “Gaglani in view of Murase in view of Wu *et al*/Maag *et al* in view of Gaglani in view of Wu *et al* fail to teach that the binder system further comprises hydroxyl groups.” NF Office Action at page 11, 5<sup>th</sup> paragraph. The Examiner asserted that “Bergstrom *et al* teach that hydroxyl groups are functionally equivalent to alkoxy groups for providing moisture curing of coating film at normal or slightly elevated temperatures with or without the addition of a crosslinking agent and a condensation catalyst (See column 9, lines 49-55).” *Id.* at page 11, 6<sup>th</sup> paragraph. The Examiner concluded that it would have been obvious

to have substituted some alkoxy groups with hydroxyl groups in Gaglani in view of Murase in view of Wu *et al*/Maag *et al* in view of Gaglani in view of Wu *et al* with the expectation of providing the desired moisture curing of coating film at normal temperatures since Bergstrom *et al* teach that hydroxyl groups are functionally equivalent to alkoxy groups for providing moisture curing of coating film at normal or slightly elevated temperatures with or without the addition of a crosslinking agent and a condensation catalyst.

*Id.* at page 12, 1<sup>st</sup> paragraph.

In the Final Office Action, in response to the Applicants' arguments to the contrary, the Examiner maintained the arguments set forth in the NF Final Office Action. Final Office Action at page 4, 2<sup>nd</sup> paragraph. The Examiner also asserted that the “automobile printed circuit board of Gaglani can be broadly interpreted as a vehicle part as claimed.” *Id.* at page 5, 3<sup>rd</sup> paragraph (internal markings omitted). The Examiner asserted that Murase taught more than powder coatings as evidenced by a statement at column 1, lines 21-27. *Id.* at page 5, 4<sup>th</sup> paragraph. Further, the Examiner asserted that the second curing mechanism in Maag *et al.* is

not a polycondensation or addition reaction between complementary reactive functional groups. Instead, Maag *et al* teach that in systems

curable by condensation reactions (See column 4, lines 63-66) no restrictions apply to the binder (See column 5, lines 7-8). Therefore, a UV-curable polyurethane (meth)acrylate binder of Calgani [sic] having alkoxysilane groups which are cured by condensation upon exposure to moisture would be a suitable binder of Maag et al.

Final Office Action at page 6, 2<sup>nd</sup> paragraph.

## **B. The Advisory Action**

In the Advisory Action mailed on March 2, 2006, the Examiner maintained all of the rejections from the Final Office Action. The Examiner, in response to Applicants' arguments, asserted that Mizutani *et al.* disclose trialkoxysilyl groups, which the Examiner further asserted moisture cure inherently. Advisory Action at page 2, 4<sup>th</sup> paragraph. The Examiner also argued that "Mizutani et al only require that the alkoxysilyl equivalent weight should be greater than 650 to avoid the formation of (too many) Si-O-Si linkages which would adversely affect the alkali resistance of the coating film." *Id.* (internal markings omitted). The Examiner further stated that "[i]t is irrelevant whether Mizutani et al. indicates that the coating compositions are cured by radical polymerization or not, because it is well known that carbon-carbon bonds undergo radical polymerization under the heat [sic], as evidenced by Wu et al." *Id.* at page 3, 2<sup>nd</sup> paragraph.

In relation to Gaglani, the Examiner argued that Applicants' specification as filed does not limit 'vehicle part' to 'a body part'. Consequently, plain and broad meaning of a claim term refers to *any* vehicle part including vehicle circuit board [sic]. Secondly, It [sic] is held that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Therefore, since Caglani's [sic] structure is capable of performing the intended use, then it meets the claim.

*Id.* at page 4, 1<sup>st</sup> paragraph (internal markings omitted). The arguments related to Murase were basically repeated from the NF Office Action and the Final Office Action. *Id.* at page 5, 1<sup>st</sup>-2<sup>nd</sup> paragraph. The Examiner also repeated arguments in relation to Maag *et al.* Advisory Action at page 6, 1<sup>st</sup> paragraph. In relation to Bergstrom *et al.*, the Examiner asserted that "[o]ne of ordinary skill in the art knows



that OH groups are hydroxyl groups no matter to what atoms they are linked. For example silanol groups are hydroxyl groups only linked to Si atom.” *Id.* at page 7, 3<sup>rd</sup> paragraph (emphasis in original).

**C. Applicants’ Traversal of the Final Office Action and Arguments in Support Thereof**

**1. Claims 1, 3, and 5-6 are Novel Over Mizutani *et al.***

The curing mechanism of Applicants’ claimed invention is based on radical polymerization of C=C double bonds and moisture curing. The coating composition disclosed in Mizutani *et al.* comprises a film-forming polyol resin (e.g., a silicone polyol), a curing agent for the polyol (melamine resin or blocked polyisocyanates), and a hydrolyzate/polycondensate of trialkoxysilane or tetraalkoxysilane. The silicone polyol contains hydroxyl groups and, optionally, alkoxysilane groups. According to the formula at column 5, line 55, of Mizutani *et al.*, C=C double bonds may also be present. Curing is effectuated by reaction of the hydroxyl groups of the polyol resin with the functional groups in the curing agent (e.g., NCO groups).

Mizutani *et al.* is not directed to moisture curing, even if alkoxysilane groups are present (see column 4, lines 3-16). When alkoxysilane groups are present in the coatings of Mizutani *et al.*, the alkoxysilyl equivalent weight is greater than 650, with a most preferred alkoxysilyl equivalent weight of about 1500 (see column 4, lines 3-6). However,

[w]hen the alkoxysilyl equivalent weight is too small, namely too many alkoxysilyl groups are present in the copolymer, the acid or alkali resistance of the coating film *will be adversely affected* due to the formation of -Si-O-Si- and -Si-O-C- linkage [sic] upon curing and the coating composition tends to gel when exposed to moist air or become susceptible to cracks when cured films are formed therefrom.

Column 4, lines 9-16 (emphasis added). Mizutani *et al.* do not add any qualifiers to this problem; the coating film *will be adversely affected* if too many alkoxysilyl groups are present. This problem also applies to the silicone polyol. Thus, moisture curing should be avoided in the coating compositions of Mizutani *et al.*

The curing mechanism in the compositions of Mizutani *et al.* is the reaction between the hydroxyl groups of the different polyols and the curing agent reactive with hydroxyl groups. The optionally present unsaturated groups in the silicon polyol

are used to chemically combine these polyols with other polyol resins (see column 6, lines 25-32). The polyol reaction product is then also reacted with the curing agent.

Thus, neither moisture curing nor radical polymerization is a curing mechanism in the coating compositions of Mizutani *et al.*, even if the basic polyol resin structural features (e.g., hydroxyl, alkoxyethyl, double bond) of the resins of Applicants' claimed invention are optionally present. Contrarily, in Applicants' claimed invention, the coating composition is expressly cured by moisture curing of alkoxyethyl groups and radical polymerization of double bonds. The hydroxyl groups of Applicants' claimed invention do not participate in curing; that is, no curing agents reactive with the hydroxyl groups are used. Applicants' thus respectfully submit that Mizutani *et al.* cannot anticipate Applicants' claim 1 invention.

Even if radical polymerization of double bonds may occur by initiation with thermal energy as asserted by the Examiner, there is no indication in Mizutani *et al.* that the optionally present C=C double bonds are polymerized via radical polymerization to cure the coating composition. The Examiner relies on Wu *et al.* to establish that radical polymerization may occur by heat. Applicants do not disagree with the Examiner that radical polymerization can occur by heat; this is well-known to one of ordinary skill in the art. However, "the extrinsic evidence [Wu *et al.*] must make clear that the missing descriptive matter is *necessarily* present in the thing described in the reference [Mizutani *et al.*]." MPEP § 2112(IV) (quoting *In re Oelrich*, 666 F.2d 578, 581-82 (CCPA 1981)) (internal quotations omitted) (emphasis added). The extrinsic evidence presented by the Examiner fails to do so. Nothing in Mizutani *et al.* indicates that the coating compositions therein are cured by radical polymerization, and the mere fact that radical polymerization may occur by heat does not rise to the level of evidence tending to show inherency. Indeed, the *intrinsic* evidence in Mizutani *et al.* itself confirms Applicants' position. For example, radical polymerization initiated by thermal energy requires thermal radical initiators. Mizutani *et al.*, however, fail to disclose *any* thermal initiators. Thus, Applicants respectfully submit that, because curing via radical polymerization is not disclosed either expressly or inherently in Mizutani *et al.*, Applicants' claimed invention is novel over Mizutani *et al.*

Because claims 3 and 5-6 are dependent claims, which recite even further limitations to the claim that has already been traversed, Applicants rely upon the arguments presented above in rebuttal to the Examiner's assertion that claims 3 and 5-6 are anticipated by Mizutani *et al.*

**2. Claims 1-6 and 9 are Nonobvious Over Mizutani *et al.* in View of Wu *et al.***

As noted in Section VII(C)(1) *supra*, Mizutani *et al.* is not directed to moisture curing or radical polymerization. Assuming, *arguendo*, that Mizutani *et al.* and Wu *et al.* can be combined, Applicants respectfully submit that the arguments submitted above in response to the anticipation rejections apply equally to the obviousness rejections. Specifically, Wu *et al.* adds nothing to the Mizutani *et al.* disclosure that relates to differences between Mizutani *et al.* and the presently claimed invention. Wu *et al.* merely discloses that radical polymerization can be initiated by heat or UV radiation, a concept well known in the art. Applicants thus rely upon the arguments presented in Section VII(C)(1) *supra* in rebuttal to the Examiner's assertion that claims 1-6 and 9 are obvious over Mizutani *et al.* in view of Wu *et al.*

Contrary to the Examiner's assertion that it is irrelevant whether Mizutani *et al.* disclose coating compositions curable by radical polymerization, it is *absolutely* relevant whether Mizutani *et al.* disclose that their coating compositions are cured by radical polymerization. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference", MPEP § 2131 (quoting *Verdegaal Brothers v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987)), and "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." MPEP § 2143.03 (citing *In re Royka*, 490 F.2d 981 (C.C.P.A. 1974)). Here, Mizutani *et al.* either as evidenced by Wu *et al.* or in alleged combination with Wu *et al.* do neither. The Examiner cited Young *et al.* (Published U.S. Patent Application No. 2004/0110856) for the notion that thermal initiators are optional in free-radical polymerization coatings cured by thermal means. Young *et al.*, however, confirm Applicants' statement that thermal initiators are disclosed when needed. Specifically, at paragraph 0045, Young *et al.* state that "[t]he initiators that are

optionally combined with the polymer(s) and monomer(s) to form the polymer solution are compounds that generate free radicals to initiate the polymerization for unsaturated compounds.” Thermal initiators are then listed in the remainder of the paragraph. If thermal free radical polymerization was actually possible in Mizutani *et al.*, Applicants respectfully submit that Mizutani *et al.* would have also at least mentioned the possibility of thermal initiators, and more likely would have listed thermal initiators useful in their invention.<sup>1</sup>

Further, free radical polymerization is not the only method by which Young *et al.* envision their polymers being polymerized. In paragraph 0024, Young *et al.* note that free radical polymerization is preferred, but nowhere is it stated that free radical polymerization is the sole polymerization method.<sup>2</sup> The logical conclusion to be reached in relation to the optional nature of the initiators in Young *et al.* is that they are optional not because of a special uninitiated thermal curing mechanism, but because Young *et al.*’s polymers do not require free radical polymerization for curing. If free radical polymerization is not used, a free radical initiator would not be necessary (and would thus be “optional”).

Because Claims 2-6 and 9 are dependent claims, which recite even further limitations to the claim that has already been traversed, Applicants respectfully submit that these claims are nonobvious over Mizutani *et al.* in view of Wu *et al.*

**3. Claims 1-6 and 8-9 are Nonobvious Over Gaglini in View of Murase in Further View of Wu *et al.* in Further View of Bergstrom *et al.***

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. Murase is directed solely to *powder* coating compositions (see column 1, lines 5-10). Gaglini, on the other hand, is directed solely to solvent-free, low viscosity liquid compositions (see column 2, lines 63-67). Gaglini is not directed to a process for the coating of vehicles. The coating of vehicle/automotive bodies requires different technology and different quality

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<sup>1</sup> All of this is speculation because, as noted above, Mizutani *et al.* do not disclose either expressly or inherently thermal free radical polymerization.

<sup>2</sup> Indeed, it is difficult to discern exactly how Young *et al.* would polymerize their polymers as no working examples are provided.

demands compared with coatings used for protecting *printed circuit boards*. The loads such coatings are exposed to are also completely different. As such, one of ordinary skill in the field of automotive coatings would not look to Gaglani to produce Applicants' claimed invention. Further, as the Examiner admits, Gaglani fails to teach multi-layer coatings. Because of the different demands of automotive coatings and protective coatings for printed circuit boards and because there is no suggestion, motivation, or disclosure in either Gaglani or Murase to modify Gaglani to produce multi-layer automotive coatings, Applicants respectfully submit that it was not obvious to use the compositions of Gaglani as clear coats or pigmented top coats in a multi-layer coating process for automobiles.

The mere fact that a circuit board may be in an automobile, a fact Applicants do not dispute, does not automatically mean that a circuit board is a "vehicle part" within the scope of *Applicants' specification*. Claim terms must be given their broadest *reasonable* definition. MPEP § 2111. Further, the plain meaning of a claim term "refers to the ordinary and customary meaning given to the term by those of ordinary skill in the art." *Id.* § 2111.01(II). The Examiner's overly broad definition of vehicle part is simply inconsistent with how one of ordinary skill in the art would read Applicants' specification. As is known to one of ordinary skill in the art—the relevant art being vehicle coatings—coating a vehicle is coating the *body* of the vehicle. Logically flowing from this fact is that a vehicle part is a *body part*.<sup>3</sup> Because a circuit board is not a body part, the Examiner's definition of vehicle part is unreasonably broad. Consequently, Gaglani is inapplicable to Applicants' claimed invention.

The Examiner relies on a single statement in Murase at column 1, lines 21-27, as support for the argument that Murase discloses more than powder coatings. Use of this statement to prove that Murase teaches more than powder coatings is completely fallacious. The statement in Murase is merely an acknowledgement of what anyone of ordinary skill in the art knows—namely, that the usual procedure in the coatings field in general, and vehicle coatings in particular, is to coat a substrate with different (more than one) coating layers. What Murase does teach, as evidenced throughout the entire disclosure, is powder coating compositions for

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<sup>3</sup> Otherwise, quite unreasonable parts would be included, such as tires, lights, seat cushions, radios, et cetera.

forming multi-layer coatings (see, e.g., column 1, lines 5-10; column 2, lines 21-27; column 2, lines 28-31; column 2, lines 34-46).

Even if the above references can be combined, Applicants respectfully submit that the Examiner's characterization of Bergstrom *et al.* is inaccurate and does not supply the disclosure missing from Gaglani, Murase, and Wu *et al.* Specifically, Bergstrom *et al.* do *not* teach that hydroxyl groups are functionally equivalent to alkoxy groups for providing moisture curing. Bergstrom *et al.* disclose the basic principle of the vulcanization mechanism for silicone sealants (see column 2, lines 24-33). Curing is effectuated by hydrolysis/condensation of silanol ( $-\text{SiOH}$ ) or alkoxy silane ( $-\text{Si}(\text{OR})_3$ ) groups. The statement at column 9, lines 51-52, that is "the polyorganosiloxane contains functional radicals, e.g. hydroxyl [or] alkoxy groups," means that the *radicals* are linked to the silicon atom (see the aforementioned groups). Hydrolysis of single alkoxy or hydroxyl groups is not disclosed, and is not chemically feasible. In other words, the OH groups mentioned in Bergstrom *et al.* are part of the *SiOH groups*, whereas in the present invention, in addition to the alkoxy silane groups ( $-\text{Si}(\text{OR})_3$ ), single OH groups are present, linked to the backbone of the binder, and are not hydrolysable. Unlike the hydroxyl groups in the present invention, the hydroxyl groups in Bergstrom *et al.* participate in curing.

The Examiner's assertion that "[o]ne of ordinary skill in the art knows that OH groups are hydroxyl groups no matter to what atoms they are linked" is inaccurate. The mere fact that a compound contains an OH group does not mean that the OH group is reactive as a hydroxyl group. For example, a carboxylic acid contains an OH bonded to a carbon. It is text book organic chemistry, however, that this OH group is not viewed in isolation, but rather the *entire* COOH group is viewed as a carboxyl group. The reactivity of this carboxyl group in comparison to an alcohol containing a hydroxyl group is, of course, vastly different.

Though not as distinct as the difference between alcohols and carboxylic acids, alcohols and silanols also have different properties. For example, organosilicon compounds differ from their organic counterparts in that organosilicon compounds have a greater hydrophobicity because of low group rotational energy. See Owen MJ, Adv. Chem. 224:705-39 (1990). Silanols have greater acidity compared to analogous alcohols because of electron back donation from oxygen

through the (p→d orbital)π bond. See West R & Baney RH, J. Am. Chem. Soc. 81:6145-48 (1959). In further support thereof, Liskiss PD demonstrated, using IR spectroscopic and titration, that “the relative order of acidities for silanols and alcohols is arylsilanols > alkylsilanols > arylcarbinols > alkylcarbinols.” Liskiss PD, “The Synthesis and Structure of Organosilanols”, Advances in Inorganic Chemistry, Sykes AG ed., vol. 42, pg. 147 (1995). The website for Paint & Coatings Industry Magazine notes that silicon resins have four basic type of reactions: alkoxy/water, alkoxy/hydroxyl, *silanol/silanol*, and *silanol/hydroxyl*. See [http://www.pcimag.com/CDA/Archives/dedf9254f36a7010VgnVCM100000f932a8c0\\_\\_\\_\\_\\_](http://www.pcimag.com/CDA/Archives/dedf9254f36a7010VgnVCM100000f932a8c0_____) (last visited May 24, 2006). If silanols and alcohols were the same as asserted by the Examiner, this list would read alkoxy/water and alkoxy/hydroxyl only.

Baxter I *et al.* succinctly summarized some of the differences between silanols and alcohols.

Silanols are compounds containing the Si-OH group and are thus analogous to the much more well known alcohols. There are, however, despite their close apparent similarities *many differences between the two types of compound*. For example, it is easier to prepare silanediols, R<sub>2</sub>Si(OH)<sub>2</sub> and silanetriols, RSi(OH)<sub>3</sub> than their carbon analogues, and, *unlike alcohols*, the silanol group has a strong tendency to undergo self condensation reactions to give compounds containing the siloxane, Si-O-Si, linkage. Such condensation reactions mean that silanol containing species are important industrial intermediates, for example, in the silicone industry polycondensation of silanols leads to the formation of silicones, and the hydrolysis of alkoxysilanes leads to silanols as intermediates in sol-gel processes and in surface functionalisation [sic] using silane coupling agents . . . . The *high acidity*, coupled with the relatively high basicity, of the silanol group means that silanols have a *strong tendency to form hydrogen bonds both between themselves and to other species containing suitable hydrogen bonding sites*. Hydrogen bonding between silicone derived organosilanols, and organic compounds in the environment or silicate surfaces may play an important role in the complete breakdown of silicones to inert inorganic materials.

Baxter I *et al.*, “Hydrogen Bonding to Silanols”, Electronic Conference on Organometallic Chemistry, 1997, *available at* <http://www.ch.ic.ac.uk/ectoc/ectoc-3/pub/010/> (last visited May 25, 2006) (emphasis added). Applicants thus respectfully submit that silanols are not the same as hydroxyls. Because Claim 1

clearly indicates that *hydroxyl groups* are required in the binders, Bergstrom *et al.* is simply inapplicable to Applicants' claimed invention.

Because Claims 2-6 and 8-9 are dependent claims, which recite even further limitations to the claim that has already been traversed, Applicants respectfully submit that these claims are nonobvious over any combination of the references cited above.

**4. Claims 1-6 and 8-9 are Nonobvious Over Maag *et al.* in view of Gaglani in Further View of Wu *et al.* in Further View of Bergstrom *et al.***

Applicants further submit that the present invention is nonobvious over Maag *et al.* in view of Gaglani in further view of Wu *et al.* in further view of Bergstrom *et al.* Independent of the fact of where the reactive groups for the secondary curing mechanism is present, the second curing mechanism of Maag *et al.* is different from that claimed in the present invention. In Applicants' claim 1 invention, the second curing mechanism is the moisture curing (hydrolysis) of alkoxysilane groups (see page 4, lines 19-23 of Applicants' specification), whereas in Maag *et al.* the second curing mechanism is a polycondensation or addition reaction between complementary reactive functional groups (see column 4, line 63 – column 5, line 53). Thus, the disclosure of Maag *et al.* teaches away from the Applicants' claimed second curing mechanism.

Further, the Examiner's assertion that the oligomers in Gaglani are silicone (meth)acrylates is incorrect. The oligomers therein are polyurethane (meth)acrylates with alkoxysilane groups (see Formulas I and II). These oligomers are chemically completely different from the (meth)acrylates disclosed in Maag *et al.* As such, there is no suggestion or disclosure in Gaglani and/or Maag *et al.*, either alone or in combination, of Applicants' claimed invention.

The UV-curable polyurethane(meth)acrylate binders disclosed in Gaglani which have alkoxysilane groups are not included in the Maag *et al.* definition of binders. The binders of Maag *et al.* are *thermally curable* by addition or condensation. One of ordinary skill in the art knows that thermal curing is a reaction between complementary functional groups. Maag *et al.* explain this reaction in



further detail at column 4, line 45 – column 5, line 53. By contrast, when curing the alkoxysilane groups in the binders of Gaglani, as well as the alkoxysilane groups in Applicants' claimed invention, water (e.g., humidity) is needed to initiate the reaction. This reaction is *moisture curing*. Applicants describe this process in relation to the claimed invention noting that moisture curing occurs by means of hydrolysis, followed by a subsequent condensation of alkoxysilane groups (see page 4, line 34 – page 5, line 2). Addition of water to alkoxysilane groups (Si-OR) leads to the formation of silanol groups (SiOH) and subsequent condensation of silanol groups leads to siloxane bridges (Si-O-Si). In other words, moisture curing is a hydrolysis reaction (i.e., a reaction with water), whereas condensation is a reaction where water is formed as a side-product.

Bergstrom *et al.* is not combinable with any of the aforementioned references for the same reasons as set forth in Section VII(C)(3) *supra*.

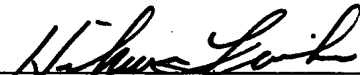
Because Claims 2-6 and 8-9 are dependent claims, which recite even further limitations to the claim that has already been traversed, Applicants respectfully submit that these claims are nonobvious over any combination of the references cited above.

**VIII. CONCLUSION**

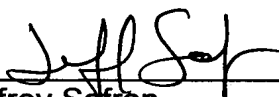
For the reasons set forth above, the Board is respectfully requested to reverse the final rejection of pending Claims 1-6 and 8-9 and indicate allowability of all claims.

Applicants believe that no fee is due in connection with the filing of the present Supplemental Appeal Brief, but, if a fee is due, please charge said fee to Deposit Account No. 04-1298 (E.I. du Pont de Nemours and Company).

Respectfully submitted,

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**CLAIMS APPENDIX**

1. A process for multi-layer coating of vehicles and vehicle parts which comprises the steps of applying at least two coating layers and curing of the applied coatings; wherein at least one of the coating layers is formed from a coating composition comprising a binder system of resin solids wherein the resin has free-radically polymerizable olefinic double bonds, hydrolysable alkoxy silane groups, and hydroxyl groups, wherein the resin solids content of the coating composition has an equivalent weight of C=C double bonds of 200 – 2000 and has a silicon content of 1 – 10 wt-%, wherein the silicon is bound in alkoxy silane groups and wherein the step of curing of the at least one coating layer comprises exposure to thermal energy thereby polymerizing the C=C double bonds via free radical polymerization and exposure to moisture thereby forming siloxane bridges from the alkoxy silane groups.
2. The process according to claim 1, wherein the coating composition comprising a binder system of resin solids having free-radically polymerizable olefinic double bonds, hydrolysable alkoxy silane groups, and hydroxyl groups is applied onto a pigmented base coat layer and cured to form a clear coat layer.
3. The process according to claim 1, wherein the coating composition comprising a binder system of resin solids having free-radically polymerizable olefinic double bonds, hydrolysable alkoxy silane groups, and hydroxyl groups and being pigmented is applied as a one-layer top coat composition onto a substrate selected from the group consisting of a primer layer, a surfacer layer and a primer/surfacer layer and cured to form a pigmented one-layer top coat layer.
4. The process according to claim 1, wherein the coating composition with a binder system of resin solids having free-radically polymerizable olefinic double bonds, hydrolysable alkoxy silane groups, and hydroxyl groups is applied as a transparent sealing coat onto a multi-layer coating to form an outer transparent sealing layer.
5. The process according to claim 1, wherein the resin solids content of the coating composition comprises resins having free-radically polymerizable olefinic double

bonds, hydrolysable alkoxysilane groups, and hydroxyl groups, an equivalent weight of C=C double bonds of 300 – 1500, and a silicon content of 1 – 7 wt-% wherein the silicon is bound in alkoxysilane groups.

6. The process according to claim 1, wherein the alkoxysilane groups comprise trialkoxysilane groups.

8. The process according to claim 1, wherein the binder system with free-radically polymerizable olefinic double bonds, with hydrolysable alkoxysilane groups, and hydroxyl groups comprises polyurethanes with (meth)acryloyl groups and hydrolysable alkoxysilane groups.

9. The process according to claim 1, wherein the thermal energy is applied by a method selected from the group consisting of action of infrared radiation, action of near-infrared radiation, action of convection heat and combinations thereof.

**EVIDENCE APPENDIX**

Attached herewith are copies of four terminal disclaimers filed under 37 C.F.R. § 1.130, which overcame double patenting rejections in the NF Office Action. Also attached herewith are the following references:

Owen MJ, Siloxane surface-activity, Adv. Chem. Ser. 224:705-39 (1990)

Lickiss PD, The synthesis and structure of organosilanols, Adv. Inorg. Chem. 42:147-262 (1995)

West R & Baney RH, Hydrogen bonding studies. II. The acidity and basicity of silanols compared to alcohols, J. Am. Chem. Soc. 81:6145-48 (1959)

Baxter I *et al.*, Hydrogen Bonding to Silanols, Electronic Conference on Organometallic Chemistry, 1997, *available at* <http://www.ch.ic.ac.uk/ectoc/ectoc-3/pub/010/>

Paint & Coatings Industry Magazine, *available at* [http://www.pcimag.com/CDA/Archives/dedf9254f36a7010VgnVCM100000f932a8c0\\_\\_\\_\\_\\_](http://www.pcimag.com/CDA/Archives/dedf9254f36a7010VgnVCM100000f932a8c0_____)

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Docket No. FA1216 US NA

**RELATED PROCEEDINGS APPENDIX**

None